

A High-Injury Network for Atlanta

How are severe and fatal-injury crashes concentrated on Atlanta's streets?

John Saxton

April 25, 2018

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I. Introduction

Following the lead of Sweden in 1997, 32 US cities have adopted Vision Zero policies that aim to eliminate all traffic deaths on their streets (Vision Zero Network 2017). After New York City in 2012, numerous cities in the northeast and on the west coast have adopted such policies as a first step toward eliminating the tens of thousands of preventable deaths that occur in the US every year.

Adding urgency to their cause is the fact that in the United States, the annual number of traffic fatalities has increased since 2011, after decreasing steadily for decades. Cities can target future investments by creating a High-Injury Network which identifies the city streets where the majority of severe injuries and fatalities occur.

This paper examines the precedent of Vision Zero policies and High-Injury Networks established in US cities and around the world. It looks at varying approaches to analyzing and representing severe injury and fatality data while considering a number of challenges posed in implementing a High-Injury Network. It aims to address the following question: How does street design in Atlanta impact the incidence of severe injury and fatality in traffic collisions?

II. Literature Review

The following literature review addresses several questions regarding High-Injury Networks and the implications for adoption by the City of Atlanta:

- What is the state of traffic fatalities globally, nationally, and in the state of Georgia? What trends can be observed?
- What is Vision Zero? What is its purpose?
- What is a High-Injury Network? What problem does it intend to solve?
- What data are used to create a High-Injury Network?
- What implementation and design responses are available to address conditions highlighted by a High-Injury Network?
- What implementation challenges exist for cities, regions, and states? How do city, state, and regional policies impact one another? How might they complement or contradict each other?
- How will this paper further research on High-Injury Networks and Vision Zero?

A. Background

In 2013, the World Health Organization reported that 1.24 million fatalities occur annually on the world's roads, making traffic injuries the eighth leading cause of death globally (WHO 2013). This figure was expected to increase by 2030 without meaningful intervention, the report states, raising the possibility that traffic fatalities could soon become the world's fifth leading cause of death.

Traffic fatalities have decreased steadily in developed nations for decades, but since 2010 traffic-related injuries and fatalities have plateaued in the United States (NHTSA 2017). In this regard, the United States is an outlier among developed nations, but that was not always the case. In 1994, 33% of the Organization for Economic Co-operation and Development (OECD)

countries saw higher a higher traffic fatality rate than the United States (OECD 2017); by 2015, the fatality rate of the United was the worst. In 1990, the United States and the Netherlands--often seen as a pioneer in road safety for building infrastructure that supports non-motorized modes--saw an identical number of fatalities per million vehicles. Today, the fatality rate for Americans is twice that of the Dutch (OECD 2017).

In 2016, 37,461 fatalities occurred on US roads, an increase of 5.6% from the year before (NHTSA 2016). Within the last few years, total fatalities have increased over historic lows in 2011, with 2014 observing the largest single-year increase in fatalities in 50 years (NHTSA 2017). The Center for Disease Control reports that between 2000 and 2010 motor vehicle crashes were the leading cause of death in the United States for people age five to thirty-four (CDC 2013).

While all roadway users have seen higher fatalities since 2011, cyclists and pedestrians are particularly vulnerable. Bicyclist and pedestrian fatalities account for 17.3% of all roadway fatalities in 2015 (NHTSA). In 2009, those modes accounted for 10.9% of all trips (FHWA 2011), but 14% of all traffic fatalities (NHTSA).

Trends in the state of Georgia have largely followed those nationally, with the state ranking 5th nationally in total number of traffic-related fatalities, while 8th in population (NHTSA 2017). For Georgia, 2015 represented a 21.2% increase in traffic fatalities from the year before (GOHS). In addition, the agency has set a target of 2,266 fatalities as its fatality target measure for 2018, a figure *58% higher* than the number of fatalities observed in 2015 (GOHS). As a percentage of total fatalities, pedestrian fatalities in Georgia have increased since 2007, and in 2014 account for 14% of total traffic fatalities (GOHS).

As shown in Table 1 below, pedestrian fatalities in Georgia have seen a sharp uptick since 2011 despite following a downward trend for decades. NHTSA data indicate that as a percentage of total fatalities, the proportion of those killed outside a vehicle (motorcyclists, pedestrians, bicyclists) is at its highest point since 1975, accounting for 33% of all fatalities. These data indicate that while progress has been made at protecting vehicle occupants, more needs to be done to ensure the safety of pedestrians, cyclists, and motorcyclists.

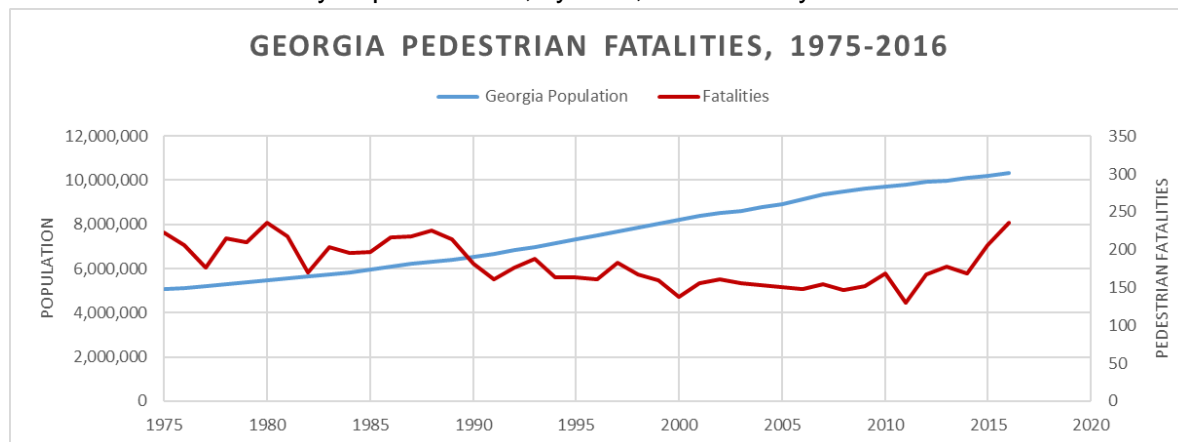


Figure 1. Pedestrian Fatalities in Georgia since 1975. Adapted from GDOT/PEDS 2017.

B. What is Vision Zero? What is its purpose?

In order to address these preventable deaths, 32 US cities have adopted Vision Zero policies that aim to eliminate all traffic-related deaths. As a policy, Vision Zero attempts to reframe the understanding of traffic collisions by looking not at individual behavior, but at the entire transportation system within which fatalities and severe injuries occur.

Part of this distinction can be observed in efforts to substitute “crash” or “collision” for “accident” in transportation terminology. “Accident” implies limited responsibility and suggests that little prevention was possible.

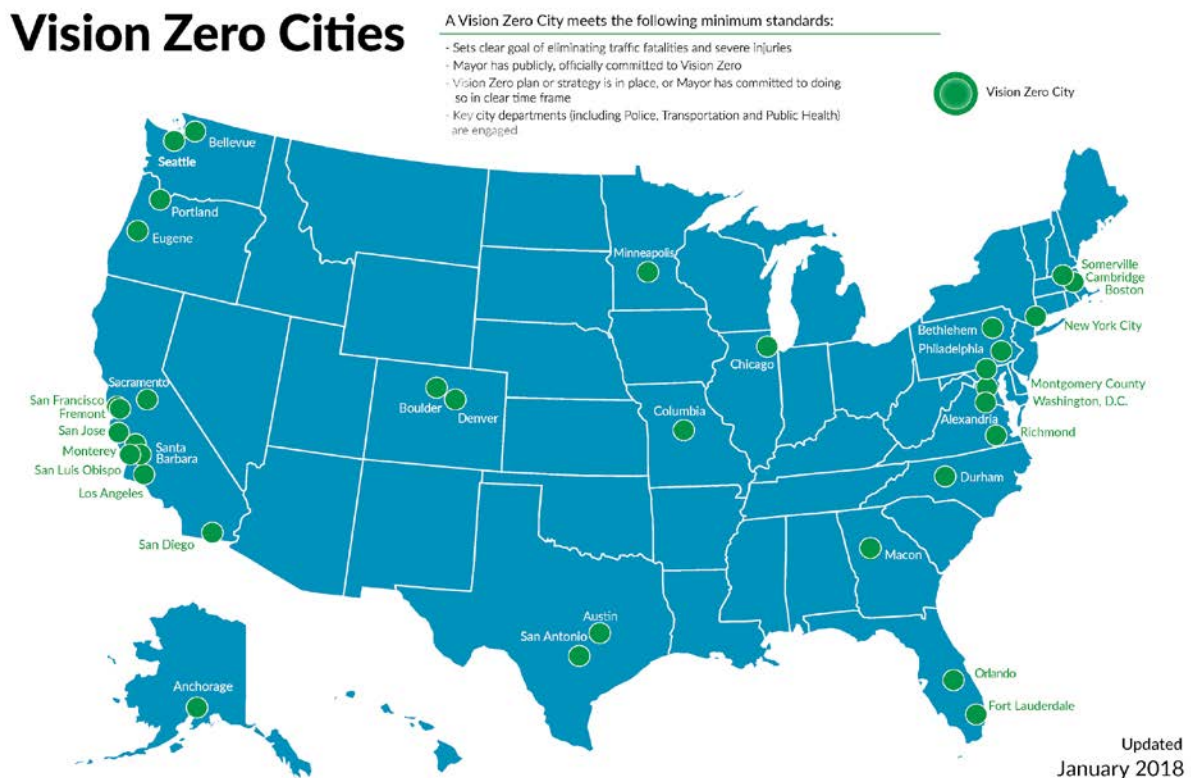


Figure 2. Map of current Vision Zero cities as designated by the Vision Zero Network. (<https://visionzeronetwork.org/resources/vision-zero-cities/>)

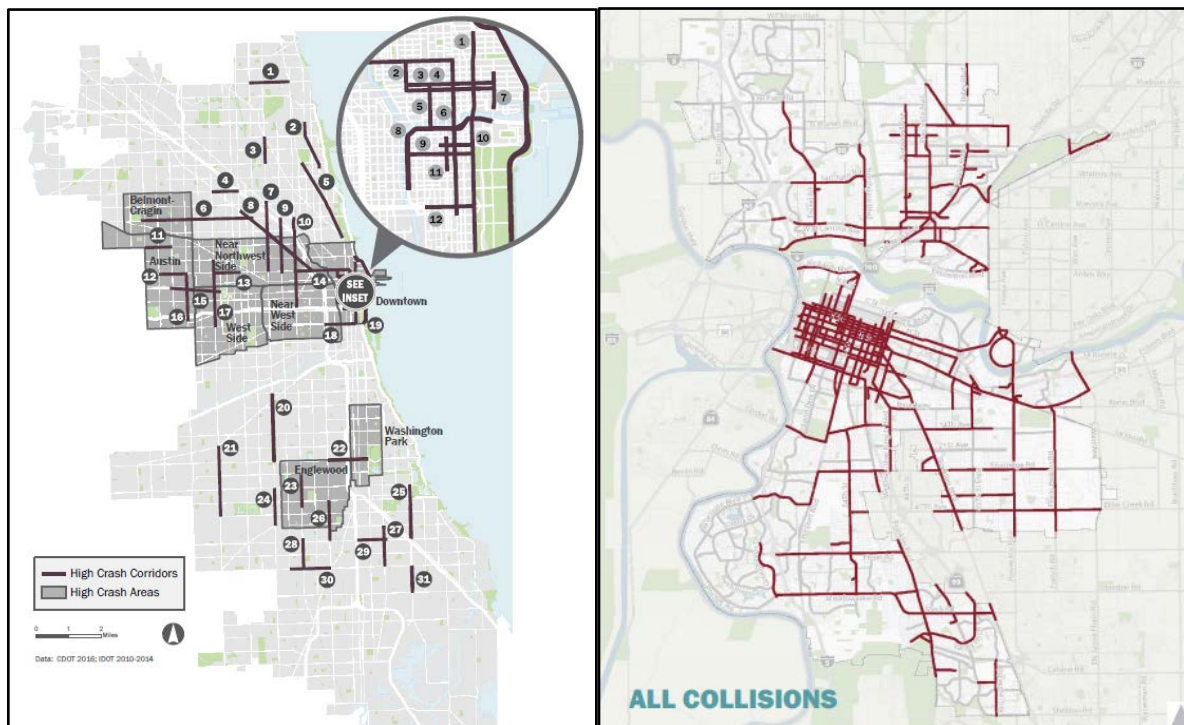
The traditional response to why traffic collisions occur focuses on driver behavior and culpability. According to research by Evans and others, road users' errors are identified as contributing or primary factors in 90% of crashes (Evans 1996). Vision Zero policies attempt to reframe that understanding by taking a more system-wide perspective to consider the broader factors, policies, and designs that account for the large and increasing number of fatalities and severe injuries observed in the United States (McAndrews 2013). Rather than locating blame solely with parties involved in the crash, McAndrews argues, “[We] could instead ask how the transportation system might have failed to protect people who made predictable errors” (ibid). Vision Zero policies aim not to eliminate human error, but to minimize its impacts.

McAndrews notes that the rationale from re-framing collisions in a systemic and collective way is that “it offers a larger set of ways to organize the infrastructure, operations, and institutions of the road transportation system around injury prevention” (2013). Vision Zero policies also look to assert shared responsibility for ensuring a safer transportation system. From the Vision Zero perspective, traffic safety is not the sole province of traffic engineers, but includes perspectives from public health, transportation, planning, and advocacy organizations. Instead of attempting to reduce and mitigate unpredictable “accidents,” Vision Zero looks to assert shared responsibility for eliminating preventable deaths.

C. What is a High Injury Network? What problem does it intend to solve?

Along with adopting Vision Zero policies, many US cities have identified the need to collect and analyze data that indicates where fatalities and severe injuries occur. Several cities have done so by creating a High Injury Network that identifies the city streets that account for the majority of traffic-related deaths and severe injuries (both Chicago and Portland use similar maps for their streets called a “High Crash Network”).

As a part of its Vision Zero policy adopted in 2014, the City of San Francisco created a High Injury Network that identified the 12% of city streets that accounted for more than 70% of its severe and fatal traffic injuries (SFMTA 2015). The purpose of doing so, the plan states, is to prioritize where future investments on streets and intersections will have the biggest impact in reducing the number of severe injuries and fatalities.



Figures 3 and 4. Chicago's High Crash Network (left) and Sacramento's High Injury Network (right).

In the most recent update to its High Injury Network methodology, the San Francisco Department of Public Health describes the network as “a snapshot in time (2013-2015) of where severe and fatal injuries are most concentrated” (SFDPH 2017). The report also contrasts its methodology with a more risk-based analysis, “[t]he Vision Zero High Injury Network provides information regarding the streets where injuries, particularly severe and fatal, are concentrated in San Francisco based on injury counts; it is not an assessment of whether a street or particular location is dangerous” (ibid 2017).

The authors seek to distinguish their methodology which focuses on counts, from rates (which would take into account some measure of “exposure,” that is, dividing the number of injuries by pedestrian or vehicle volumes or population). This distinction is telling and may exist for several reasons:

- 1) Vision Zero is less interested in changes of degree or improved rates. Most Vision Zero policies are clear that there is no other acceptable number of preventable deaths.
- 2) Data limitations—Exposure measures (particularly pedestrian volumes) are difficult and costly to obtain.
- 3) Legal liability—Asserting that an intersection is dangerous could be interpreted as an acknowledgement of legal liability on the part of the city and its agencies. In that sense, SFDPH, SFMTA and the City of San Francisco walk a fine line between identifying areas in need of intervention in line with Vision Zero's goals of taking a systems approach to safety without assuming legal liability for future fatalities or severe injuries.

D. What data are used to create a HIN?

Police crash reports are the primary dataset used by cities to identify crash locations that make up a High Injury Network. In most states, crash data are recorded electronically by officers at the scene of the collision and are stored electronically in a statewide database. Some challenges with using this data source are that it is not publicly accessible, it may lack detail about the collision that could inform future analyses, it includes inaccurate location information, or it is not available in a timely manner (City of Los Angeles). Portland's High Crash Network methodology notes that there is often a significant delay (more than a year) in when the state DOT makes complete information available (City of Portland). Interviews with officials at the Atlanta Regional Commission for this analysis also indicate that even when data are available, they require cleaning, standardizing, and post-processing (Rushing 2017).

How reliable are the data?

Recent studies indicate that many crashes, approximately 30%, go unreported (M. Davis & Co. 2015). While the majority of unreported crashes are property-damage-only collisions, a study by the National Highway Traffic Safety Administration indicated that of all unreported crashes, approximately 10% of injury-crashes are not reported to police (ibid.). Earlier studies indicate a slightly higher number of collisions resulting in injury, 13.5%, are unreported (Greenblatt et al. 1981).

In a 1999 study of 13 countries (including the U.S.), Elvik and Mysen note that collision-

reporting was shown to be incomplete at all levels of severity but that the more severe the injury, the more likely the event was reported (Elvik et al. 1999). Their results show that mean reporting levels for the 13 countries were 95% for fatal injuries, 70% for serious injuries (admitted to hospital), 25% for slight injuries (treated as outpatients), and 10% for very slight injuries (treated outside hospitals). Their results also show that only 49% of hospital-treated injury collisions in the United States are reported in official road collision statistics and that reporting tends to be highest for car occupants and lowest for cyclists (ibid.).

In order to address the need for more complete injury data, the San Francisco Department of Public Health recently released an update to its High Injury Network that includes mapped hospital injury data along with police injury data. In doing so, San Francisco is the first city in the country to use hospital data to identify unreported traffic injuries (SFDPH 2017). While this data source holds promise for creating a more accurate picture of the injuries taking place on city streets, there are challenges with obtaining and using hospital data. Portland's High Crash Network Methodology notes "The Oregon Trauma Registry (OTR) offered a promising dataset of serious injuries; however the data was difficult to match with crash data because of its focus on health data, while ODOT [Oregon DOT] focuses on crash characteristics" (Portland 2016). In addition, concerns over patient privacy have limited usage of hospital datasets. Following the lead of San Francisco, it is likely that other cities will incorporate hospital injury data into their methods along with other possible data sources, like collision data from insurance companies, and bicycle collision data collected from local bike shops (a current research topic of Dr. Kari Watkins at the Georgia Institute of Technology).

The use of hospital data sets holds promise because of the results shown in San Francisco. In using hospital-reported injury data from Zuckerberg San Francisco General (ZSFG), San Francisco Department of Public Health (SFDPH) and San Francisco Municipal Transportation Agency (SFMTA) found that 27.7% of pedestrian severe injuries were not included in SFPD data, 33.1% of bicyclist severe injuries were not included, and 39.1% of vehicle severe injuries were not included (SFDPH 2017).

In addition to allowing the agencies to account for what would have been unreported injuries, its methodology also used a clinical assessment of severe injury rather than relying on SFPD-reported assessment of severity. Doing so led to a net increase of 361 severe injuries, roughly 50% more injuries than what were previously identified as severe (SFDPH 2017).

What variations exist in the methodologies used to map injury data and create a HIN?

As a tool, High Injury Networks are relatively new instruments cities use to reach their Vision Zero goals and in the case of San Francisco and other cities, they are a resource that reflects the effort and involvement of multiple city agencies and departments (Public Health, Transportation Agency, Planning and Public Works). But researchers and transportation departments have used other tools like statistically based risk-estimation methods that identify dangerous locations by considering built environment variables.

An analysis by Pulugurtha et al. (2007) identifies commonly used methods to create rankings of high-crash zones and recommends a new method to compare and prioritize high-crash areas. The study also notes the need for a more refined and less subjective process to identify such zones in the first place. The authors note that methods such as crash frequency, crash density, and crash rate are commonly used measures to indicate needed intervention.

- Crash frequency is a count of crashes within a given time period in which each event is given equal weight. An extension of this method would be to apply a weight for crashes based on severity.
- Crash density normalizes crash frequency by a given area (e.g. crashes per ¼ mile) but doesn't take into account pedestrian or vehicular volumes
- Crash rate accounts for volumes by using an "exposure" measure (usually based on average annual daily traffic, population, or observed vehicle/pedestrian counts)

Such methods, the authors argue, offer varying results and introduce subjectivity on the part the analyst that could be reduced by using a method they introduce called a "crash score" (ibid.). The authors note that one particular challenge with the crash rate measure is that exposure metrics for non-vehicular modes are not readily available and tend to be both costly and time-consuming to obtain (ibid.). The authors recommend that a possible alternative exposure metric would be to use population data for workers or residents within the zone that could serve as a surrogate measure of pedestrian activity (ibid.).

Pulugurtha et al. (2007) recommend a composite metric using the three commonly used methods noted above (crash frequency, crash density, and crash rate) that is also normalized by each individual method's maximum score. The authors argue that this method could be a less subjective way for cities and public agencies to prioritize areas in need of intervention. While this method might help analysts compare and prioritize individual zones, it offers little guidance as to how to identify high crash zones in the first place. The authors note, "Identifying high pedestrian crash zones based on the density map was done manually...Software developments in the future could perhaps help automate this process even further" (ibid. 2007).

Other approaches have been to assess the risk of pedestrian collisions by using statistical methods that consider the likelihood of collisions based on built environment characteristics. This method often produces somewhat counter-intuitive results in that pedestrian amenities like marked crosswalks are often correlated with increased risk of pedestrian collisions. In a study of Seattle using collision data from 2007 to 2013, Quistberg et al. showed the following:

- Locations with traffic signals had twice the collision rate of locations without a signal and those with marked crosswalks also had a higher rate.
- Locations with a marked crosswalk also had higher risk of collision.
- Locations with a one-way road or those with signs encouraging motorists to cede the right-of-way to pedestrians had fewer pedestrian collisions.
- Collision rates were higher in locations that encourage greater pedestrian activity (more bus use, more fast food restaurants, higher employment, residential, and population densities).

San Francisco High Injury Network Methodology

Along with using innovative methods for collecting data described above, San Francisco uses a network approach to identifying high-crash areas in the city as described above (SFDPH 2017). As with the composite method used by Pulugurtha, an initial step in San Francisco's methodology is to geocode each injury and fatality using GIS software (Kronenberg 2014). The next step in the agency's methodology is to assign each injury to an intersection and the adjoining street segments, and weighting severe injury and fatalities counts by three (ibid). Corridors are then summarized by corridor length, fatalities/severe injuries per mile, total injuries per mile, and weighted injuries per mile. A threshold weighted count of nine injuries or greater was used to determine inclusion in the city's High Injury Network. Kronenberg et al. note that summarizing collision data by corridors "mitigates inherent year-by-year variability in collision data at a specific location and facilitates pedestrian safety measures that are more effectively implemented on corridors, such as road diets and speed control measures" (ibid.).

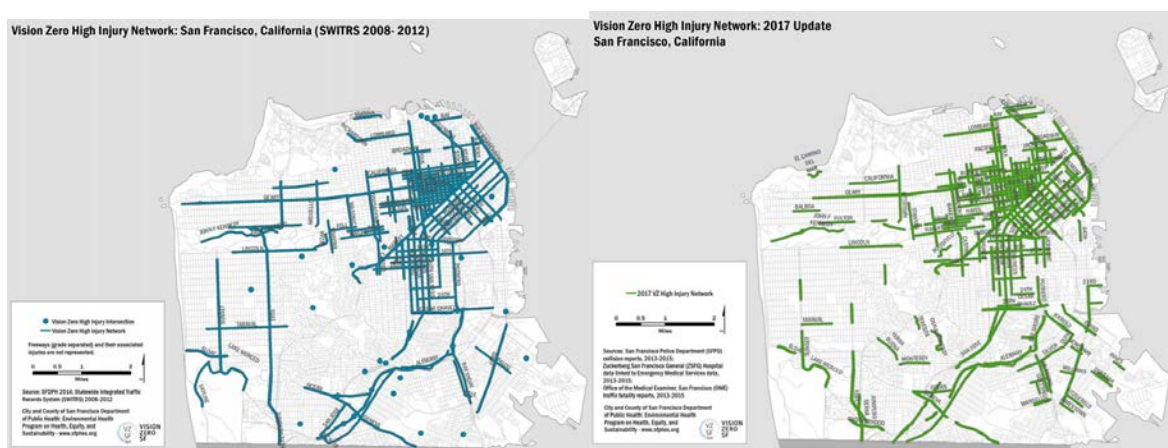


Figure 5 and 6. San Francisco Vision Zero High Injury Network 2015 (right) and 2017 (left)

Portland's High Crash Network Methodology

The City of Portland released its Vision Zero plan in December of 2016 and applies what it calls a High Crash Network to determine the city streets most in need of intervention. Unlike San Francisco, Portland's methodology document states that the streets included in its High Crash Network *are* its most dangerous (City of Portland 2016). Its methodology for determining what streets are included also varies. Its first step, the methodology document states, is to identify high crash streets for pedestrians, bicyclists, and vehicles separately and create a high crash network for each. The bicycle and pedestrian crash networks are then combined with the vehicle-crash network if vehicle collisions resulted in a fatality or severe injury (City of Portland 2016). The composite high crash network also incorporates region's Communities of Concern Index to prioritize investment in underserved neighborhoods.

Where San Francisco focused on blocks and their adjoining intersections, Portland separates its analysis into corridors and intersections, defining corridors as all street segments that share a name. Figure 6, below, shows Portland's High Crash Network contrasted with San Francisco's High Injury Network. One obvious difference is that Portland's network features a few long

corridors, while San Francisco's network features many smaller segments (some only a few blocks long).

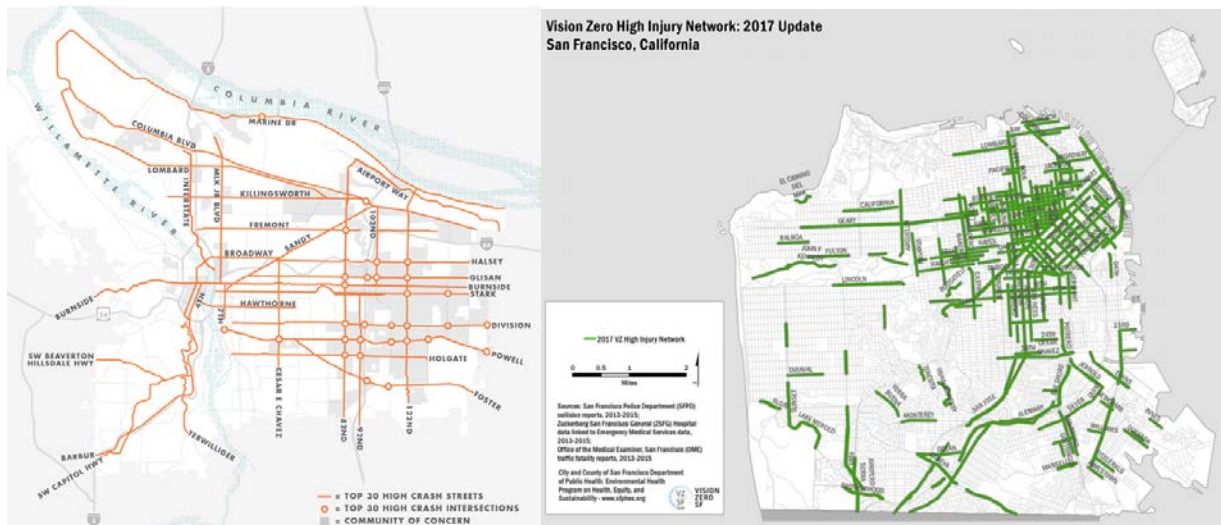


Figure 7 and 8. Portland's High Crash Network, 2016 (left) and San Francisco's High Injury Network, 2017 (right)

Another difference between the two networks is the time span each city uses; Portland's network uses a decade of crash data, while San Francisco's update uses only three years' worth. In an interview with Byron Rushing, the Atlanta Regional Commission's Bicycle and Pedestrian Planner, he recommended using a dataset of three years, because a longer timeframe that uses less recent data would likely include travel patterns that are no longer relevant (Rushing 2017).

Other Methodologies

In an analysis for Los Angeles DOT's High Injury Network, Richer et al. note that considering the relative novelty of High Injury Networks as a tool for cities, high variability exists between their methodologies. How injuries and fatalities are weighted along with how locations are designated, whether by intersection, adjoining blocks, or miles-long corridors, depends on the agency (ibid.). Other methodologies described by Los Angeles DOT in its analysis are included below.

Agency	Methodology
Seattle DOT	Identifies priority corridors based on a crash rate of total crashes per million vehicles entering the corridor. Priority corridors are defined as 1.5 standard deviations above the City's mean collision rate. Seattle is also unique among many US cities in that it receives collision data directly from the Seattle Police Department and maintains its database of collision records at the city level

Chicago DOT	Prioritizes high-crash corridors based on the total number of pedestrian crashes per mile, with fatal and severe injury crashes receiving higher weight than other crash types.
New York City DOT	Identifies corridors ranked by pedestrian fatalities/severe injuries per mile. Identifies intersections by total number of pedestrians killed or severely injured.

E. What implementation and design responses are available to address conditions highlighted by a high injury network?

Leah Shahum, a leader in the Vision Zero movement in the United States and former Executive Director of the San Francisco Bicycle Coalition has studied the efforts of Germany, Sweden, and the Netherlands to identify the strategies those countries use that account for the progress they have made toward achieving Vision Zero goals. She notes that of all the possible strategies to reduce fatalities, none is more important than reducing speeds. “In all three of these countries,” she writes, “the leaders of traffic safety efforts emphasize that managing speed is the #1 determinant in their successes in improving safety” (Shahum 2015).

Many Vision Zero policies refer to studies that show the likelihood of pedestrian fatality increases dramatically with the speed of the striking vehicle. A frequently cited study by Tefft from 2011 points to the role that higher vehicle speeds play in pedestrian fatalities (Tefft, 2011). Tefft notes that pedestrians struck by a vehicle travelling at 17 mph have a 90% chance of survival, but that likelihood decreases to 50% for pedestrians struck by vehicles travelling at 33 mph, and 10% for vehicles travelling at 48 mph (ibid).

An important consideration, Shahum notes, are speed differentials between vehicles and other road users. Shahum argues that areas which see a mix of people moving at different speeds (i.e. walking, bicycling, and driving), should have lower vehicle speeds to accommodate that mix. In addition to slower vehicle speeds, she suggests that street design--separating vehicles from cyclists and pedestrians--and engineering, rather than education and enforcement, have had a greater impact in preventing severe injuries and fatalities (2015).

In preparing its High Injury Network, the Los Angeles Department of Transportation reviewed Vision Zero efforts from four peer agencies (NYC DOT, Chicago DOT, Seattle DOT, and Florida DOT). In addition to identifying various methodologies for creating their High Injury Network, the analysis also showed that implementation strategies to reduce pedestrian fatalities and injuries vary by agency. Those implementation efforts, along with the five strategies identified by the City of Denver in its High Injury Network, are summarized in the table below.

Agency	High Injury Network Countermeasure Focus
New York City DOT	Reducing speeds through automated enforcement, re-timing signals, aggressive ticketing, lowering speed limits and installing additional speed limit signs
Seattle DOT	Reducing speeds by implementing road diets and lane narrowing. Additional countermeasures identified on a case-by-case basis
Chicago DOT	Changing street cross-sections by using road diets and targeting intersections by modifying signals
Denver DOT	Multimodal street design, parking restrictions, leading pedestrian interval, reducing speed limits and installing median refuge

Portland's Vision Zero documents provide a more graphic representation of specific countermeasures that could help prevent severe injuries and fatalities that largely focus on reducing speeds and providing infrastructure that supports pedestrians and bicyclists (City of Portland 2016).



Figure 9. Portland Vision Zero Action Plan. *Anatomy of a Dangerous Street*.



Figure 10. Portland Vision Zero Action Plan. *Examples of Street Safety Design Elements*

Crash Reduction Factors

The Los Angeles DOT identified some of the most effective countermeasures available by using the Federal Highway Administration's *Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes*. The most effective interventions and their corresponding Crash Reduction Factors (CRF), that is, the amount by which certain types of collisions have been reduced using a given intervention, are shown below.

Intervention	Crash Reduction Factor
Pedestrian Countdown Timers - signal that counts down crossing time in place of WALK/DON'T WALK signal	Reduced pedestrian collisions by between 52% and 70%
Protected Left-turn Phase Conversion -	99% reduction in left-turn collisions
Pedestrian Scramble - All-way stop for vehicles to allow pedestrians to cross in all directions	35% reduction in pedestrian collisions
Optimize Signal Timing for Bicyclist - Timing signals for speeds of 15-20 miles per hour	Reduced pedestrian and bicyclist injury collisions by 37%
Pedestrian Refuge Islands/Raised Medians - Installed medians in the middle of the roadway to shorten pedestrian crossing distances	56% reduction in pedestrian collisions (refuge island); 46% reduction in pedestrian collisions (raised median and marked crosswalk)
Raised Pedestrian Crossing/Raised Crosswalk - Pedestrian street crossings raised to sidewalk level	36% reduction in fatal and injury collisions for all modes

Road Diet - Change roadway cross-section from 4 lanes to 3	Reduced all collisions by 29%
Separated Bike Lane/Cycle Track - cycling facilities separated from traffic by a physical barrier	95% decrease in risk of bicyclist injury (compared to streets without bicycling infrastructure)
Separated shared-use path - off-street path for cyclists and pedestrians	88% decrease in risk of injury for children; 86% decrease in risk of injury for adults (compared to on-street bicycling)
Improved Lighting - consistent placement of streetlights, pedestrian scale lighting at crosswalks	27% reduction in injury across all modes (intersection lighting) 23% reduction in injury collisions across all modes (corridor lighting)
Parking Restrictions Near Intersections/Daylighting - remove parking spaces to improve sightlines for drivers and pedestrians	30% reduction in pedestrian collisions
HAWK signal - pedestrian-activated crossing light	69% reduction in vehicle/pedestrian collisions
High-visibility Crosswalk - distinct pavement markings (continental zebra or ladder pattern)	48% reduction in pedestrian collisions

F. What implementation challenges exist for cities, regions, and states? How do city, state, and regional policies impact one another? How might they complement or contradict each other?

McAndrews notes that Vision Zero calls for reframing our understanding of traffic collisions in order to take shared responsibility for reducing fatalities and severe injuries. She notes that the tension between mobility and accessibility makes implementing Vision Zero a challenge, “calling for slower speeds is in conflict with traditional transportation planning strategies that emphasize mobility and traditional claims that higher traffic speeds are necessary to increase access to activities and markets (i.e., through lowering the time cost of accessibility)” (2015). While few would take issue with the goal of reducing fatalities, many object to countermeasures that limit the mobility of some in order to improve the safety for others. In other words, adopting a Vision Zero policy is one thing, but implementing countermeasures that would make it a reality is something else. McAndrews also notes that the traditional traffic engineering culture may not be quick to assume responsibility for what they see as the mistakes of others.

Funding is one of the first hurdles cities must overcome in order to make Vision Zero a reality. Because many of the countermeasures cities identify in their Vision Zero policies address street design and engineering interventions, cities often list funding for those interventions as a top priority. Considering the recommendations offered by Portland in the images above, none come

without hard costs. To address a lack of funding available for Vision Zero efforts, Portland voters approved a city gas tax to generate \$64 million over four years to support interventions targeting areas on its High Crash Network (Portland 2016).

Georgia receives funds from the Highway Safety Improvement Program (HSIP) for the purpose of reducing the number of crashes and addressing common crash types (GDOT/PEDS 2017). This funding purpose comes into conflict with Vision Zero goals in that some Vision Zero implementation may in fact increase the number of crashes while reducing the number of fatalities. In its review of safety countermeasures, the Los Angeles DOT notes,

Rather than focus on reducing the incidence of all collisions, the City will prioritize its efforts on the types of collisions that are more likely to result in a severe or fatal injury.

Therefore, an intersection with fewer serious and fatal injuries, even if there are more total crashes, is an acceptable outcome of Vision Zero interventions.

In that sense, state policies that look to reduce crashes may be at odds with Vision Zero that look to reduce deaths and severe injuries.

While Vision Zero policies have been largely a city-level effort in this country, many states have put forward a goal of Toward Zero Deaths. As of 2012, 30 states (including Georgia) mention the objective of zero deaths in their State Highway Safety Plans (Munnich et al. 2012). Munnich et al. indicate that for some states the goal may exist in name only, “In some cases, the mission, vision, or goal of zero deaths is mentioned only once or twice in SHSP, while in other cases it appears regularly and clearly informs aggressive, collaborative safety programs” (ibid). In a 2012 analysis of states with that included language about zero deaths in their State Highway Safety Action Plans, only four states met all five criteria Munnich et al. considered to indicate a substantive Toward Zero Death (TZD) policy (ibid). Unlike more locally driven Vision Zero efforts, many seemingly parallel efforts by states with the goal of Toward Zero Deaths lack crucial details about specific metrics and infrastructure improvements.

In addition to funding and policy challenges, Vision Zero efforts also face legal challenges when it comes to implementing interventions. The Georgia Pedestrian Safety Action Plan identifies the legal limitations within the state of Georgia to adopting some of the countermeasures aimed at reducing speeds (GDOT/PEDS). It notes that the state code prohibits the use of automated speed enforcement devices (GA Code § 40-14-2) and limits the implementation of installing red light cameras by capping the fine at \$75 (GA Code § 40-14-20) making the cost of such devices outweigh the revenue produced by such fines and therefore prohibitively expensive in some cases (ibid).

Other cities have had to address the challenge of amending state legislation to achieve their Vision Zero goals. In many states, cities cannot reduce the speed limits of their streets below a specified threshold. In New York City, Mayor Bill de Blasio worked with New York State legislators to authorize legislation allowing the city to lower its speed limits from 30 miles per hour to 25 because, as the city’s one-year update on Vision Zero notes: “People hit by a car going 25 MPH are half as likely to die as those hit by a car going 30 MPH” (New York City 2015).

G. How will this paper further research on High Injury Networks and Vision Zero?

Traffic safety data is the primary source of our knowledge about the traffic safety environment, human behavior and vehicle performance. Therefore, in order to address these safety problems, we require good data, meaning data [that] are timely, accurate, complete, uniform, integrated and accessible.

-Federal Highway Administration, Crash Data Improvement Guide, 2010

While 32 US cities have adopted Vision Zero policies and many have created High Injury Networks to identify the city streets that account for the highest rates of death and severe injury, the City of Atlanta has done neither.

This paper will offer City of Atlanta officials, public health officials, Department of Public Works and Department of Planning leaders recommendations about how to reduce the many traffic-related severe injuries and fatalities that occur on Atlanta's streets every year. Its primary contribution will be to provide easily accessible and comprehensible data to inform future transportation investments.

This paper will offer a data-driven example to city officials of how to identify the city streets that account for a majority of deaths and severe injury. In doing so, it will inform future decisions about where to target infrastructure funding aimed at reducing severe injuries and fatalities. It will also offer leaders the opportunity to learn from implementation of Vision Zero policies in other cities and provide a guide for how to implement needed investments. In addition, it will serve as a model to neighboring jurisdictions by offering a local example of how they might create a High Injury Network in support of Vision Zero goals.

It will inform other parallel efforts aimed at promoting traffic safety. As a supplement to its *Walk. Bike. Thrive!* plan, the Atlanta Regional Commission is developing its regional Bicycle and Safety Action Plan to identify needed projects to improve safety across the region. While varying in scope, this paper will likely identify similar locations in need of investment.

This paper will also help make the case for countermeasures aimed at reducing speeding, whether that includes automatic enforcement, City control of state routes, or speed limit reductions.

Methodology

In order to identify the streets where the majority of severe and fatal injury crashes occur, individual crashes (which exist as geocoded points with a latitude and longitude in the crash database) need be assigned to appropriate streets which exist as lines in a geographic information system (GIS). Assigning crashes to streets allows for the creation of additional

variables in the streets attribute table, among them: number of crashes, number of fatalities, number of severe injuries, fatalities and severe injuries per mile, etc.

Once each crash has been assigned to an individual street, it is possible to summarize which streets are responsible for the majority of severe and fatal injury crashes—and what percent of severe and fatal injury crashes occur on a given percentage of the city's total street network.

Geocoded crashes were downloaded from the Georgia Electronic Accident Reporting System (GEARS) and loaded in ArcGIS along with a street centerline shapefile from the Atlanta Regional Commission. The GEARS query selected for crashes from 2014 through 2016 for Fulton and DeKalb counties that were reported to have a fatality or a severe injury in the crash report. Figure 1, below, shows a total of 4316 crashes in Fulton and DeKalb counties, from 2014 to 2016. Figure 2 shows all of the crashes that occurred within the Atlanta city limits, indicating a clear delineation of crashes on the interstates and limited access highways, like GA400 and Langford Parkway.

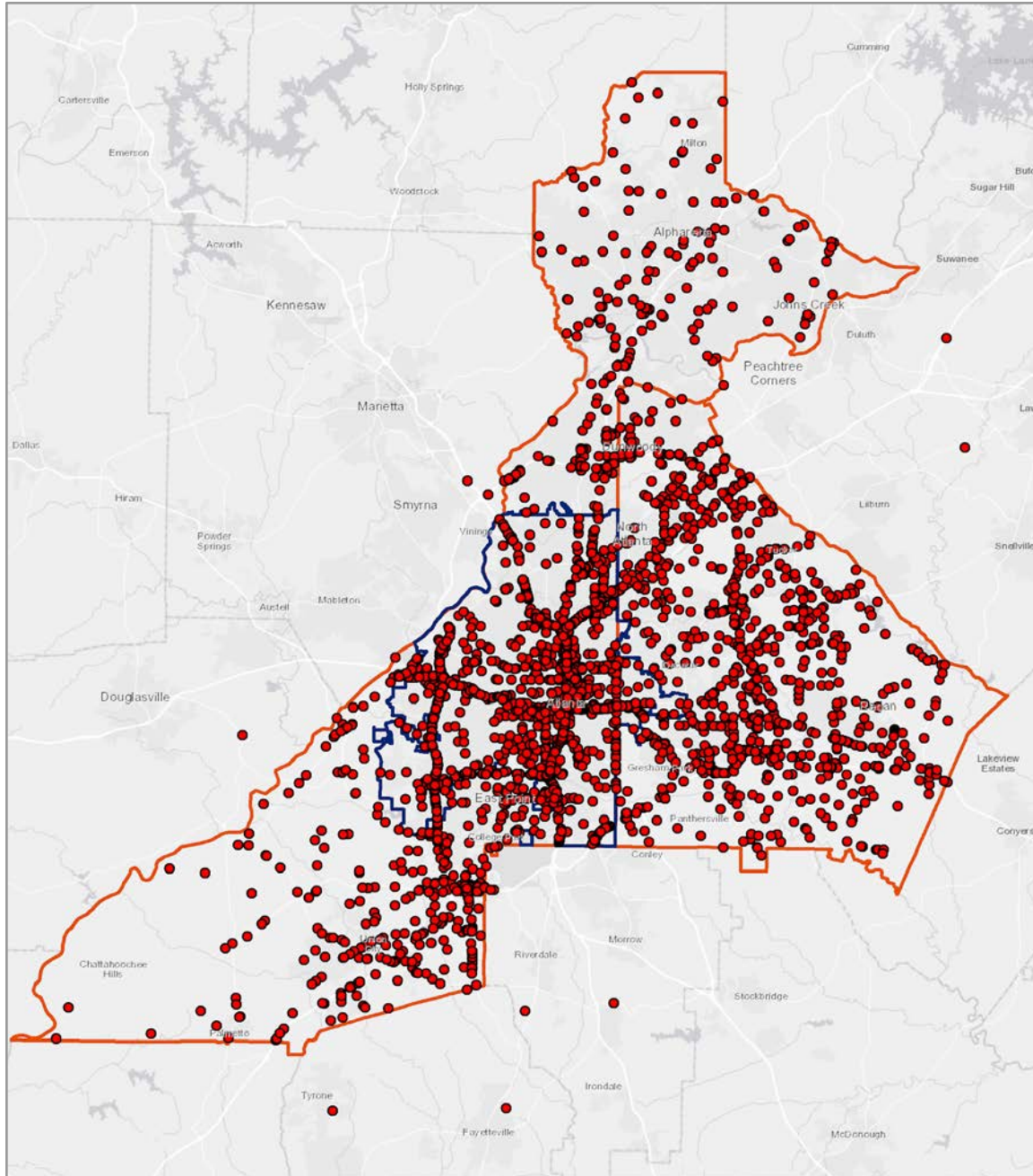


Figure 11. Severe and Fatal Injury Crashes in Fulton and DeKalb Counties, 2014-2016

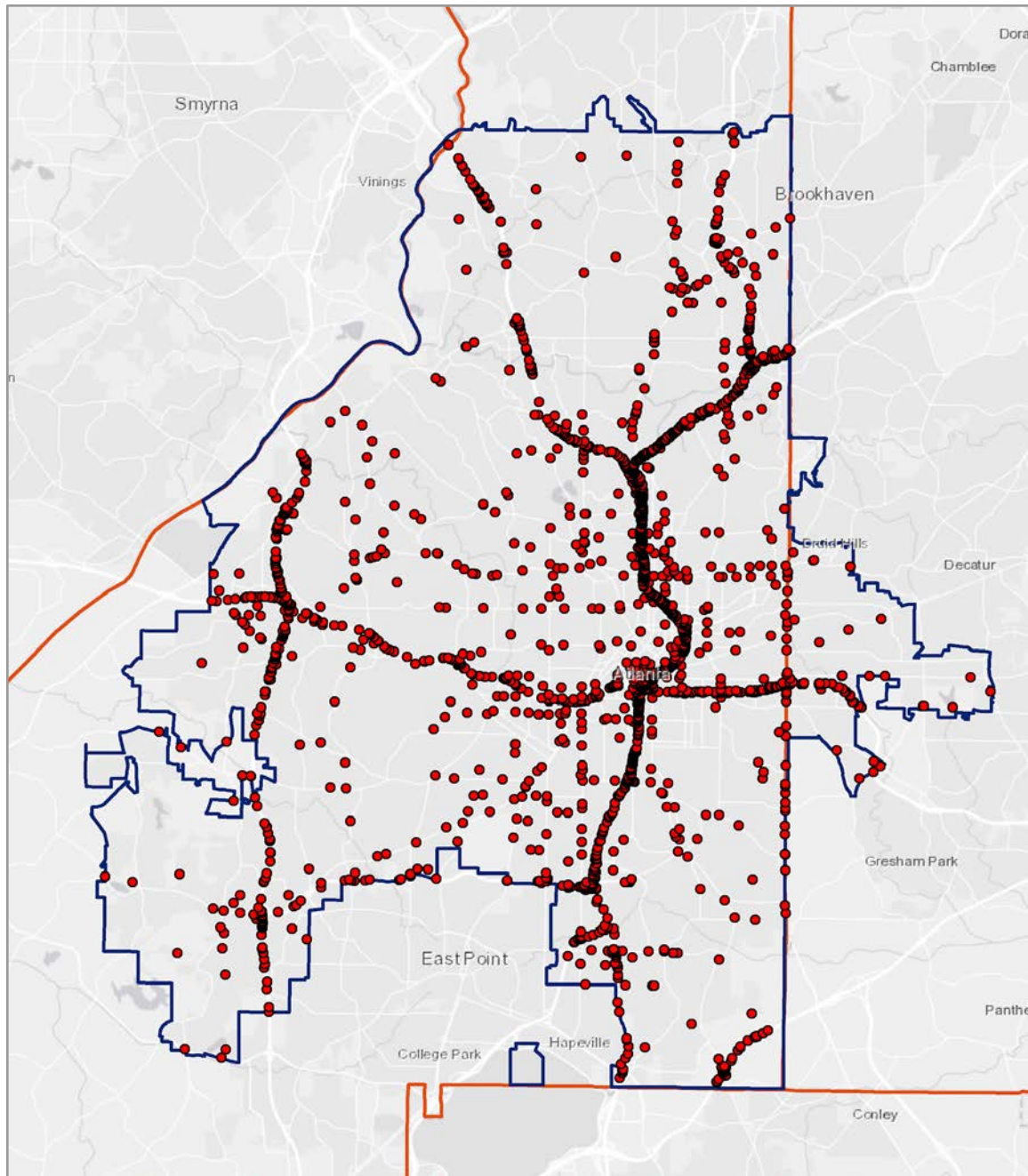


Figure 12. Severe and Fatal Injury Crashes in Atlanta, 2014-2016

Following the methodologies of other High-Injury Networks looking to identify only surface streets, crashes that included a freeway identifier in the attribute table for crash location ("I85", "I75", "I285", "I20", etc.) were removed from the analysis. A separate streets feature class was created after removing those streets with a functional classification of "freeway", "expressway", "interstate" or "entrance/exit ramp". Both streets and crashes were clipped by the City of Atlanta boundary from a Georgia cities shapefile.

Of the 660 fatal or severe injury crashes within the city limits (after removing those reported to occur on an interstate), 68 showed zero values in the attribute table for fatalities or severe injuries. Correspondence with GEARS technical support indicated that such occurrences likely resulted from data entry error on the part of the reporting officer and that individual crash reports would provide further detail about crash outcomes. As a result, 38 crashes were manually re-coded to reflect severe injury or fatality data included in the crash report as accurately as it could be interpreted. Review of the remaining 30 crash reports were determined to not include a severe injury or fatality and were therefore removed from the analysis.

Attributes in the street centerline feature class were dissolved on the “Label” attribute to aggregate small street segments into longer, continuous corridors that share a common name, rather than one composed of isolated segments. The rationale for doing so was to create a continuous high-injury network that corresponds to both users’ lived experience of the street network and the scope of infrastructure improvement projects. A spatial join was performed to assign each street (line) to the closest crash (point) so that within the crash attribute table, a column was added identifying the closest street.

The crash attribute table was grouped by street name using a pivot table to identify the total number of fatalities and injuries that occurred on streets sharing a common name. A *weighted injury* field was created that summed total severe injuries with three times the number of fatalities. The crash attribute table was then joined to the street centerline shapefile on the common field of street name (“Label”) in ArcGIS. Using the distance field from the street centerline feature class, a *weighted injuries per mile* variable was created.

A threshold for inclusion in the High-Injury Network was determined based on two variables: *weighted injuries per mile* and *total weighted injuries*. Any street with a *total weighted injuries* score about 3 and a *weighted injuries per mile* score above 3 was included in the High-Injury Network. Some cities’ HIN methodologies include only a *weighted injuries per mile* threshold. It was necessary to include *total weighted injuries* so as not to bias very small segments with few severe injuries (e.g. 1 injury) that then could result in a high *weighted injuries per mile* score.

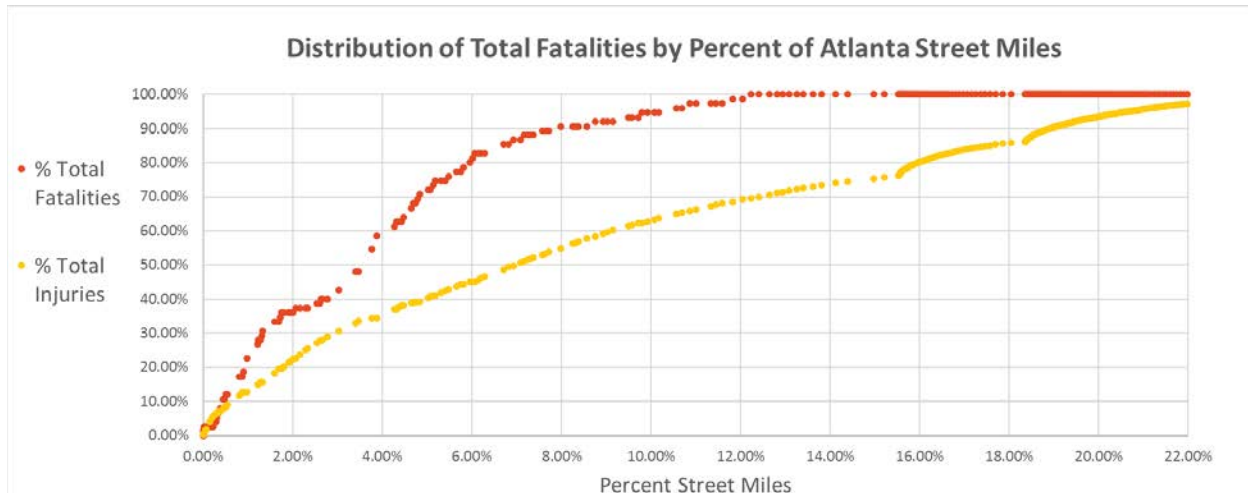


Figure 13. Distribution of Fatalities by Percent of Atlanta Street Miles

The figure above identifies the percentage of Atlanta’s street network and a corresponding percentage of severe injuries (shown in yellow) and fatalities (shown in red). It shows that all fatalities and severe injuries are accounted for by roughly 25% of the street network (approximately 400 miles of Atlanta streets). A narrower threshold for the High-Injury Network helps identify where the city can target infrastructure improvements to get “the most bang for its buck”. The two factors for determining the threshold (>3 weighted injury sum and >3 weighted injuries per mile) correspond to 7.3% of the city’s street network.

IV. Results

The City of Atlanta High-Injury Network is shown in the figure below. The network identifies 7.3% of Atlanta’s streets that account for 88% of fatalities, and 59% of severe injuries. Totalling 84 streets and 123 centerline miles, the network accounts for 66 fatalities and 452 severe injuries that occurred on Atlanta streets between 2014 and 2016. As shown in the figure below, clusters of high-injury streets are shown in the city’s south and west sides, along with several streets in midtown and downtown. In fact, roughly two-thirds of the High-Injury Network is located west of Northside Drive and south of I-20, communities with higher black and low-income populations, compared to the rest of the city.

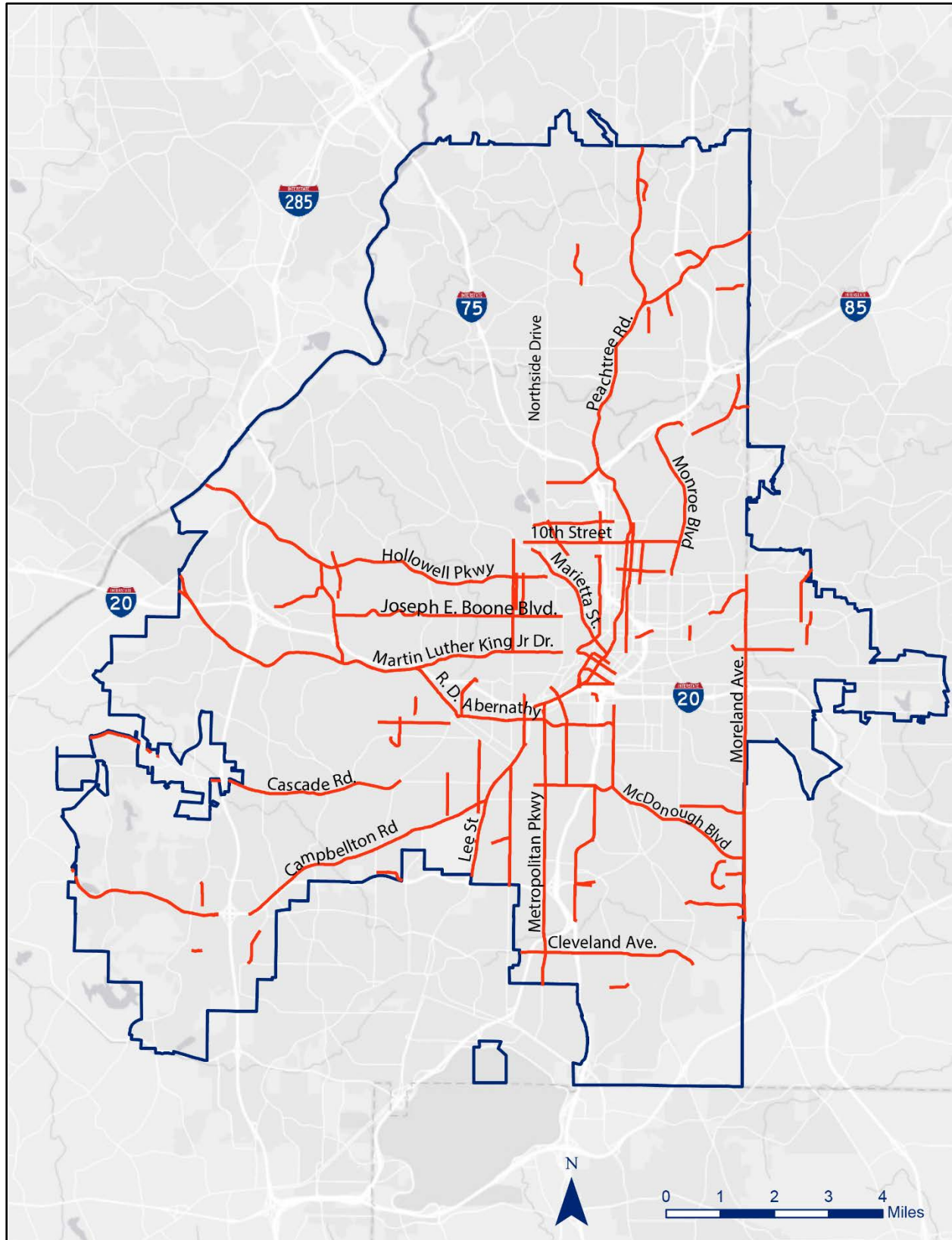


Figure 14. City of Atlanta High-Injury Network

A ranking of the ten streets that received the highest *weighted injury score* (severe injuries + 3x fatalities) is shown below. The streets below account for **one-third of the fatalities** that occurred on Atlanta streets during the study period, despite constituting less than 3% of the city's total streets.

Streets	Length (Miles)	Wtd Injury per mile	Sum of Wtd Injury	Injuries	Fatalities	% Total Miles	% Total Injuries	% Total Fatalities
Moreland Ave SE	4.46	8.07	36	24	4	0.27%	2.75%	5.33%
Donald Lee Hollowell Pkwy NW	6.45	4.81	31	19	4	0.65%	4.93%	10.67%
Martin Luther King Jr Dr SW	6.58	4.56	30	24	2	1.05%	7.68%	13.33%
R.D. Abernathy Blvd SW	3.99	7.27	29	20	3	1.29%	9.98%	17.33%
Cascade Rd SW	4.30	6.75	29	23	2	1.55%	12.61%	20.00%
Campbellton Rd SW	7.19	3.48	25	19	2	1.98%	14.79%	22.67%
Metropolitan Pkwy SW	4.87	4.72	23	8	5	2.27%	15.71%	29.33%
Joseph E Boone Blvd NW	4.01	4.98	20	14	2	2.51%	17.32%	32.00%
10th St NW	1.54	12.35	19	19	0	2.60%	19.50%	32.00%

Table 1. Top Ten High-Injury Network Streets by Weighted Injury (Severe Injuries + 3x Fatalities)

The ten streets listed above provide Atlanta leaders and policy makers with an even more actionable list of where to target future infrastructure improvements. Appropriate countermeasures implemented on the 47 miles of streets shown above would likely result in the sharpest reduction of fatalities and severe injuries on Atlanta's streets.

How Do Atlanta Neighborhoods with High-Injury Network Streets Differ from Those Without?

Further analysis of socioeconomic characteristics of Atlanta block groups shows disparities between neighborhoods with High-Injury Network streets compared to those without. Using ArcGIS, each Atlanta census block group was given the total street mileage of the High-Injury Network within its borders. The characteristics of block groups with HIN streets were then compared to those without HIN streets.

For Atlanta's political leadership to better understand the disproportionate impact of the High-Injury Network, total HIN mileage was summarized by Atlanta City Council District and Neighborhood Planning Unit (NPU). Table 2 below identifies the total mileage of the network located within each city council district. It shows that Districts 12, 4, and 3 have the most total mileage of HIN streets. Close to half of the entire High-Injury Network is located in those three city council districts. Column E shows the length of HIN streets within each district normalized

by the total mileage of streets within that district (column B divided by column D). This indicates that District 4 has the highest percentage of streets that are HIN streets (i.e. 15.0% of all streets in District 4 are High-Injury Network streets).

A. City Council District	B. HIN miles	C. % of Total HIN in District	D. Total Streets	E. % of District Streets on HIN
1	10.0	8.1%	140.8	7.1%
2	10.4	8.4%	95.8	10.9%
3	15.9	12.9%	123.9	12.8%
4	17.7	14.3%	117.8	15.0%
5	4.2	3.4%	129.1	3.3%
6	6.0	4.9%	114.5	5.3%
7	8.2	6.6%	106.4	7.7%
8	4.3	3.5%	179.2	2.4%
9	6.8	5.5%	181.9	3.7%
10	9.5	7.7%	133.7	7.1%
11	10.6	8.6%	161.3	6.6%
12	19.7	16.0%	165.6	11.9%
Sum	123.3	100%	1649.9	

Table 2. High-Injury Network Distribution by Atlanta City Council District

NPU	HIN Miles	% of HIN	Total Miles	% NPU Streets on HIN
A	0.9	0.7%	90.9	1.0%
B	9.3	7.5%	134.0	6.9%
C	0.4	0.3%	74.0	0.5%
D	0.0	0.0%	64.5	0.0%
E	14.7	11.8%	96.1	15.3%
F	4.3	3.5%	71.8	6.0%
G	0.7	0.6%	49.8	1.5%
H	3.1	2.5%	55.4	5.6%
I	8.9	7.2%	93.0	9.5%
J	6.3	5.1%	58.9	10.7%
K	3.2	2.6%	36.2	8.9%
L	4.4	3.6%	30.5	14.5%
M	10.1	8.1%	79.0	12.7%
N	4.4	3.5%	64.0	6.8%
O	1.5	1.2%	57.7	2.6%
P	3.4	2.7%	81.1	4.2%
Q	0.8	0.7%	12.4	6.7%
R	5.5	4.4%	54.8	10.0%
S	6.2	5.0%	54.2	11.4%
T	6.3	5.1%	51.7	12.2%
V	8.9	7.1%	62.9	14.1%
W	3.4	2.8%	87.2	3.9%
X	6.6	5.3%	54.3	12.1%
Y	3.8	3.0%	42.3	8.9%
Z	7.1	5.7%	85.9	8.3%

Table 3. High-Injury Network Distribution by Atlanta City Council District

Table 3 shows that NPU's E, M, and B have most total HIN street miles. Normalization by total street miles within each NPU shows that NPU's E, L, and V have the highest percentage of streets that fall on the High-Injury Network.

While the High-Injury Network impacts different NPU's and City Council Districts unevenly, lower income and higher minority census block groups are more likely to be exposed to the High-Injury Network, compared to the city as a whole. Socioeconomic information from block groups with High-Injury Network streets were compared to block groups with no High-Injury Network streets in the tables below.

	Median HH Income	White	Black
With HIN	\$38,391	35.02%	57.22%
Without HIN	\$63,818	48.29%	44.99%

Table 4. Block groups with HIN streets compared to those without by income and race

Table 4 shows that block groups without HIN streets have significantly higher incomes than block groups with High-Injury Network streets. In addition, block groups with HIN streets have high a higher percentage of black residents. While these data are based on survey estimates and include some margin of error, they nonetheless indicate that exposure to the High-Injury Network disproportionately impacts black and lower-income Atlantans.

	SOV	Carpool	Public Transportation	Bicycle	Walked	Owners w/ No Vehicle Available	Renters w/ No Vehicle Available
With HIN	66.39%	7.29%	11.11%	0.74%	5.49%	2.10%	16.05%
Without HIN	75.61%	6.53%	6.43%	0.77%	1.82%	1.37%	8.77%

Table 5. Block groups with HIN streets compared to those without by workers' commute mode and vehicle ownership

In addition, Table 5 shows that workers in neighborhoods with HIN streets are more likely to commute by public transportation or walking, and less likely to commute via personal vehicle. Households in such block groups are also more likely to lack access to personal vehicles altogether. These data explain, in part, why more severe and fatal injuries occur in these Atlanta neighborhoods—those walking or taking public transportation are more vulnerable users of Atlanta's streets, lacking safety protections of those travelling by personal vehicle.

The figure below provides further illustration of how the High-Injury Network correlates with income. It shows roughly two-thirds of the High-Injury Network intersecting or adjacent to block groups with a median household income of less than \$55,000. In fact, less than 1 mile of the High-Injury Network is located in the very top income category. A bivariate correlation between miles of HIN streets within each block group and median household income produced a

Pearson Correlation of $-.281$ (with significance at the $.01$ level—indicating that the total length of a block group's HIN streets is slightly and inversely correlated with income. In other words, higher median incomes are slightly correlated with lower miles of HIN streets.

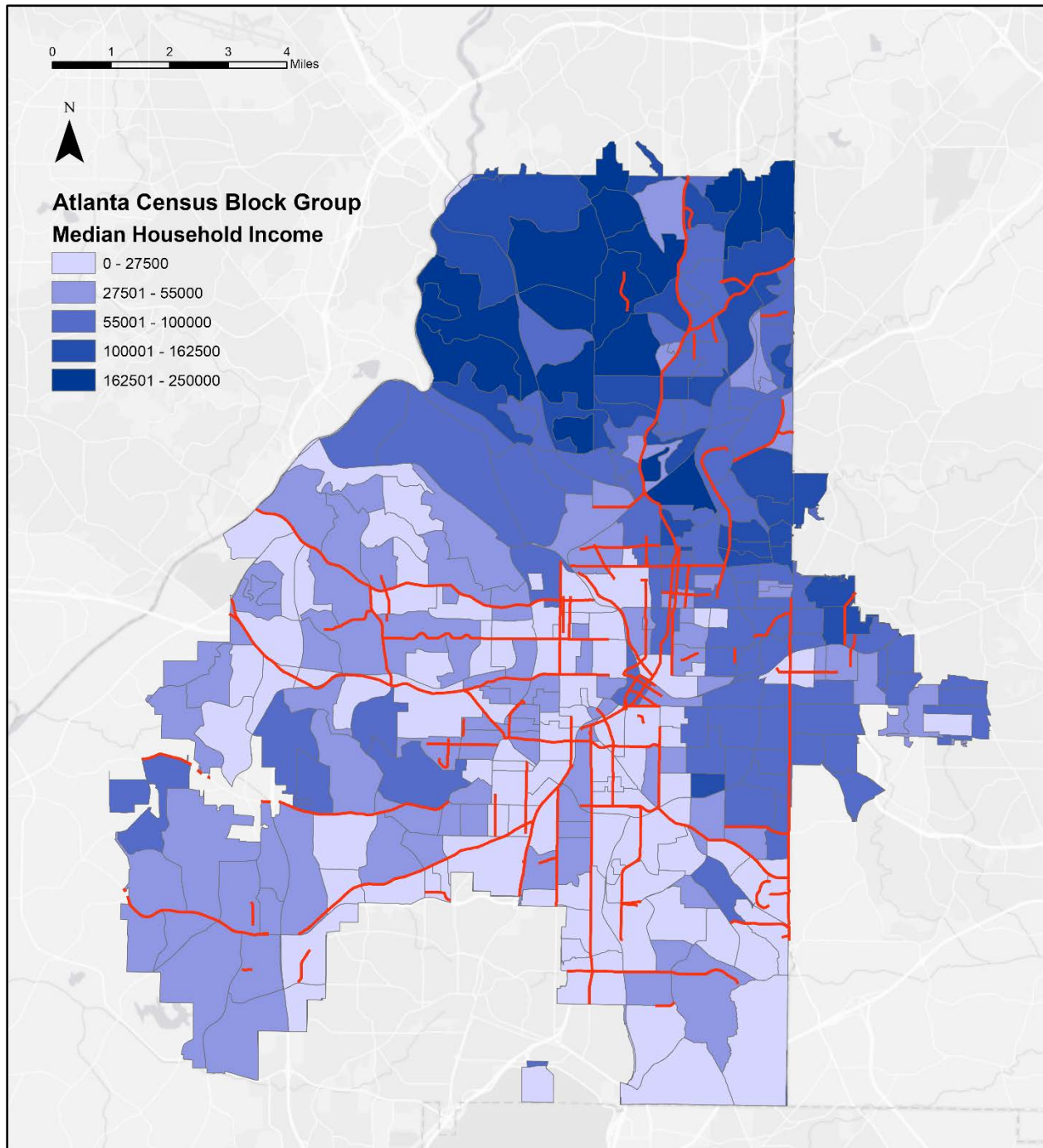


Figure 16. Atlanta's High-Injury Network by block group median household income.

Similar analyses were conducted looking at block groups' racial, commuting, and vehicle ownership characteristics. Figure 17 below shows the HIN as it correlates with each block group's percentage of minority population. It shows that much of the High-Injury Network runs through block groups that have minority populations of greater than 90%. A bivariate correlation of percent minority population and length of HIN streets produced a Pearson Correlation of .252 (with significance at the .01 level). This result indicates a block group's percent minority population is slightly correlated with the amount of HIN streets within its borders—as its percent minority population increases, so does the length of its HIN streets.

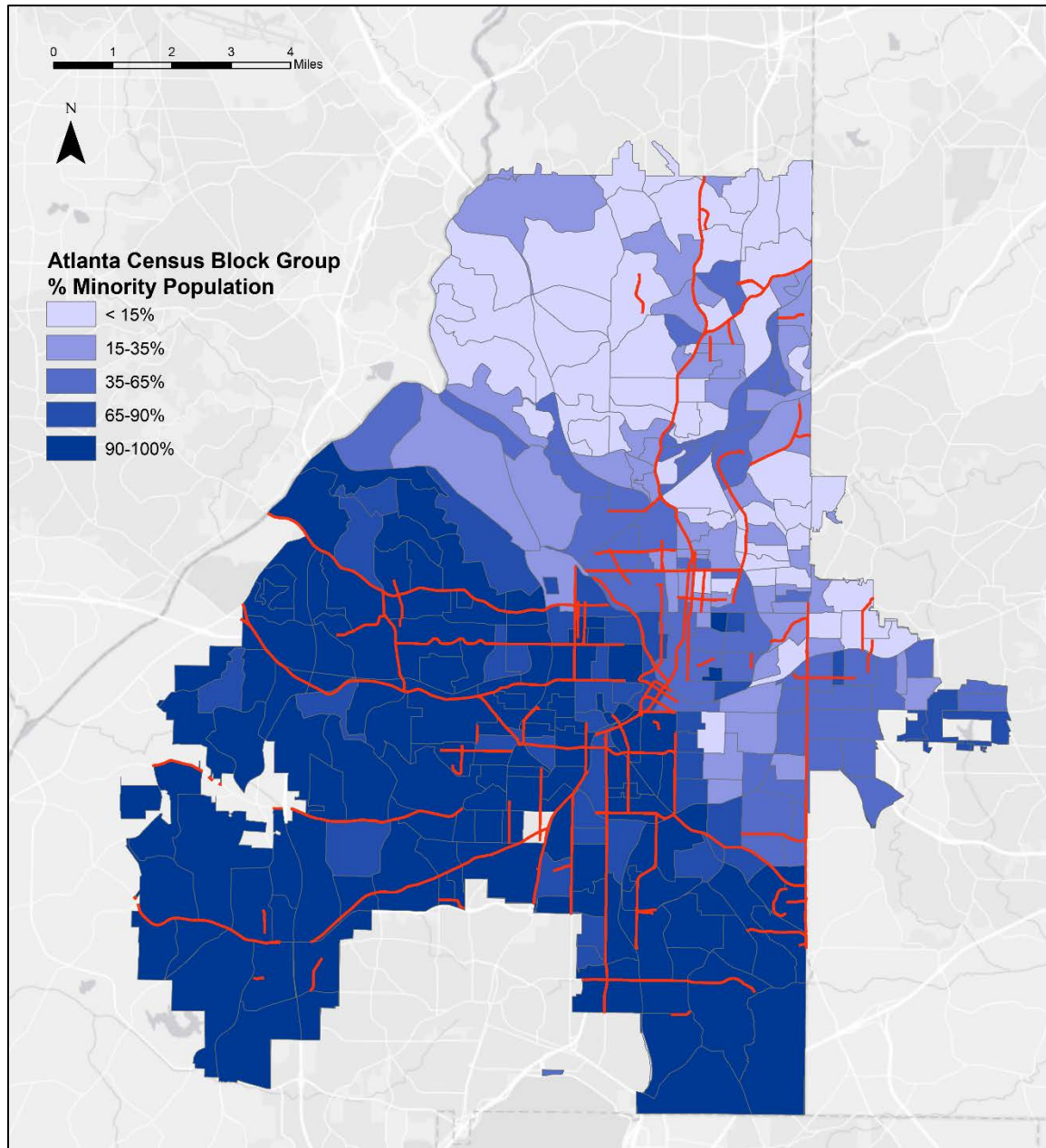
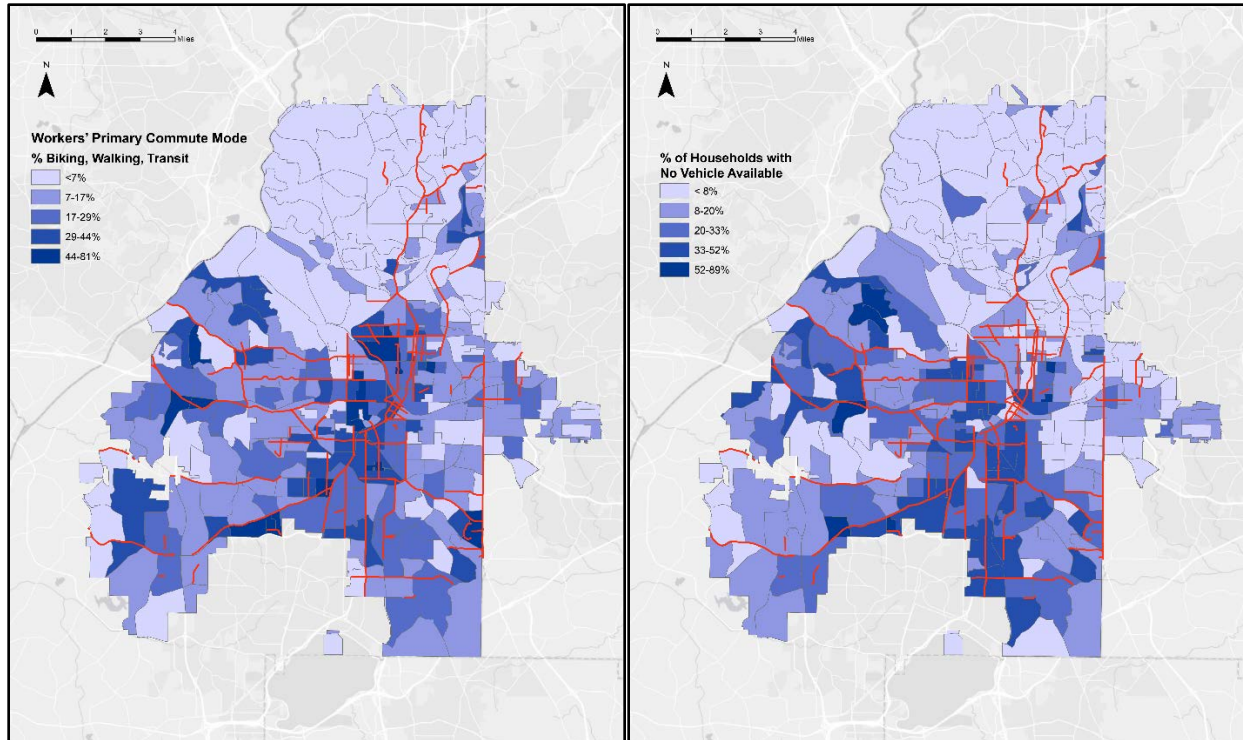


Figure 17. Atlanta's High-Injury Network by block group median percent minority population



Figures 18 and 19. Atlanta's High-Injury Network by Workers' Primary Commute Mode (left) and Percentage of Households with No Vehicle Available (right).

Figures 18 and 19 above show the relationship between the city's High-Injury Network and block groups by commuting mode and vehicle ownership. Figure 18 (left) shows that the vast majority of the High-Injury Network is located in block groups with higher rates of workers commuting by biking, walking, and taking transit. Figure 19 (right) shows that the High-Injury Network is concentrated in block groups with higher percentages of households with no vehicle available. Correlation between the length of HIN streets and percentage of workers commuting by biking, walking, and taking transit produced a Pearson Correlation of .269 (with significance at the .01 level). This result indicates that a slight correlation exists between miles of High-Injury Network within a block group and the percentages of workers commuting via biking, walking or taking transit. A similar correlation was shown between miles of High-Injury Network and the percentage of households with no vehicle available (.268 with significance at the .01 level).

Overall, slight statistical correlations were shown between amount of HIN streets and a given block group's percent minority population, percentage of commuters walking, biking, or taking transit, and percentage of households with no vehicle available. A slight inverse correlation was shown between miles of HIN within a block group and its median household income.

What makes High-Injury Network streets different from other streets?

Much of the Vision Zero literature identifies reducing vehicle speeds as a primary goal (Shahum, 2015). Given the number of injuries and fatalities attributed to the streets in the table above, it is likely that they see vehicle speeds that are higher than comparable streets. Unfortunately, data

about vehicles' prevailing speeds is not readily available. The socioeconomic data shown above also indicate that these streets likely see higher pedestrian volumes.

One might also assume that vehicle volumes on HIN streets distinguish them from non-HIN streets. While vehicle volumes play a role (Moreland Avenue SE, Lee Street SW, and Hollowell Parkway NW see vehicle volumes near or in excess of 20,000 cars per day), they are not the sole determining factor. It is true that low volume, neighborhood streets are less likely to be identified as a HIN street. But streets like Martin Luther King Jr Drive SW and Joseph E Boone Boulevard NW see volumes of 9000 and 5400 vehicles per day, respectively, and yet are identified as two of the worst ten streets in terms of their *weighted injury* score.

Additional research and data collection should target HIN streets to better identify the characteristics that distinguish them from non-HIN streets. Among other factors, research should consider prevailing and posted speeds, vehicle volumes, pedestrian/cyclists volumes, number of lanes, streetscape characteristics, and adjacent land use characteristics.

The photos below provide an illustration of a typical cross-section for several of the top ten High-Injury Network streets. Countermeasures should be targeted to the unique conditions of each street and no one solution will apply to each individual case. The photos do however, provide some indication of which countermeasures may help minimize fatalities and severe injuries, and many improvements aimed at reducing vehicle speeds and providing better facilities for pedestrians, cyclists, and transit users are recommended here.



Figure 16. Moreland Avenue SE

Moreland Avenue sees some of the highest vehicle volumes of any street on the High-Injury Network. At the same time, other conditions make it an unwelcoming environment for other users: long distances between marked crosswalks make it difficult for pedestrians to cross Moreland Avenue safely; numerous curb cuts and driveways throughout the corridor make for unpredictable vehicle turning movements.



Figure 17. 10th Street NW

10th Street NW crosses over I75/I85 as it passes through Atlanta. Collisions are concentrated around adjacent intersections on 10th Street between the freeway off-ramp and Techwood Drive. Despite forming the northern boundary of Georgia Tech's campus and an important connection to Midtown Atlanta no bicycle facilities, and minimal pedestrian facilities, exist on 10th Street NW.



Figure 18. Joseph E. Boone Boulevard NW

Joseph E. Boone Boulevard is notable because of its relatively low vehicle volumes (between 5000 and 6000 vehicles per day). Many other top ten HIN streets see much higher vehicle volumes. Other Atlanta streets not included on the High-Injury Network, like Ponce de Leon Ave, North Ave and Northside Drive see higher vehicle volumes as well. It's likely that pedestrian volumes are much higher on Boone Boulevard and many nearby residents may rely solely on walking, biking or taking transit.



Figure 19. Donald Lee Hollowell Parkway NW

Like many other HIN streets, Hollowell Parkway sees high vehicle speeds and long distances between marked pedestrian crosswalks. Curb cuts and driveways are prevalent along the corridor and minimal facilities exist for pedestrians like lighting or buffers between the sidewalk and passing vehicles.



Figure 20. Lee Street SW

A typical cross-section of Lee Street SW features five lanes of fast-moving traffic. At the same time, many active commercial uses exist along the corridor. In addition, the West End Marta Station and the Mall at West End see high pedestrian volumes.

V. Recommendations

“Vision without funding is hallucination”

- Chris Tomlinson, Executive Director, Georgia Regional Transportation Authority and State Road and Tollway Authority

As defined by the numerous cities nationwide that have asserted Vision Zero goals, the purpose of a High-Injury Network is to identify the city streets that account for the vast majority of severe injuries and fatalities. While traffic fatalities are infrequent events, the distribution of such events across the city is not random. In Atlanta, roughly two-thirds of the streets that form the city’s High-Injury Network are found on the city’s south and west sides—areas of the city that also have higher minority populations, lower median household incomes, and lower rates of private vehicle ownership. For that reason, establishing a Vision Zero policy for the city is both a public health issue and an equity issue.

One of the primary purposes of this analysis is to illustrate the need for a High-Injury Network and a broader Vision Zero policy that takes immediate steps to reduce the number of traffic-related severe injuries and fatalities that occur on Atlanta’s streets. Establishing such a policy should also provide attention and resources to address the issue. Rather than viewing traffic-related severe injuries and fatalities as unpredictable “accidents,” the network provides an accessible illustration of where such events occur, empowering leaders to prioritize targeted infrastructure improvements.

Improving Outcomes

While adopting a Vision Zero policy will provide much needed attention to the issue of traffic safety within the city, taking steps to improve outcomes requires infrastructure investments that will make Atlanta’s streets safer for all users. A Vision Zero policy and an accompanying High-Injury Network will elevate traffic safety as a city priority and recommend locations for infrastructure investment.

Future roadway improvements through Renew Atlanta along with regular maintenance performed by GDOT and the Department of Public Works should consider a street’s High-Injury Network status when determining project priority. Projects eligible for LCI funding through the Atlanta Regional Commission that include HIN streets should receive priority when applying for implementation funds.

Exactly how the city’s High-Injury Network streets should be improved depends upon the specific site conditions, but the vast majority of Vision Zero cities identify vehicle speed as the single most important factor affecting crash outcomes. Existing conditions of each High-Injury Network street and recent crash reports should be reviewed by Renew Atlanta and DPW staff to identify needed improvements for each street with input from neighborhood leaders and residents. Community input can provide valuable data about close-calls, information that may not be represented elsewhere.

Citing research by Tefft, many cities have taken steps to reduce vehicle speeds by lowering the speed limit and using tools like speed cameras, red-light cameras, along with targeted roadway and streetscape features like bulb-outs, neck-downs, and planting street trees that have been shown to discourage motorists' from speeding.

Improving the Network

In addition to targeting investments to improve outcomes based on the existing High-Injury Network, the network itself can be improved through enhanced data collection and data quality assurance. As identified in this analysis, approximately 10% of crashes initially attributed to city streets lacked accurate severe injury and fatality data that required review of individual crash reports. Further, fatality data reported by the Governor's Office of Highway Safety and provided by GEARS should be reconciled to provide a more accurate assessment of the traffic fatalities. Currently, the two resources show a disparity of approximately 200 fatalities, a difference staff at GOHS attributed to reporting officer error.

While the Governor's Office of Highway Safety Annual report is publicly available, access to GEARS data requires application authorization. Privacy concerns should certainly be taken into account, but transparency and public awareness about traffic safety would be improved if crash data were more accessible and available.

Following the improvements shown in San Francisco's HIN 2017 update, more accurate injury data should be collected from hospitals that identify injuries from unreported crashes and also provide a clinical assessment of injury severity, rather than relying on the reporting officer's judgment.

Regular updates to the High-Injury Network should be performed on a 1-2 year basis by city staff to ensure that the network incorporates the most recent crash data available. An improved network should also consider high-injury intersections, creating an additional resource to identify fatal and severe-injury crashes reported at intersections.

Improving Vision Zero

Vision Zero policies in the United States have grown out of local advocacy efforts, particularly within the bicycle and pedestrian advocacy communities. Where active and engaged communities exist, Vision Zero policies have followed. But efforts to improve traffic safety are needed across the country, as fatalities have reversed their downward trend in recent years, not just in places with strong bicycle and pedestrian advocacy efforts.

In addition, Vision Zero cannot afford to ignore the vast majority of traffic fatalities that occur on interstates and freeways. Within the Atlanta city limits approximately 75% of all severe or fatal injury crashes occur on freeways and interstates. A high-injury network for city streets offers targeted locations for improvements, but without accounting for interstate collisions Vision Zero will fall well short of achieving its goal.

Conclusion

While cities across the United States have embraced the goals of Vision Zero to reduce traffic fatalities and severe injuries on city streets, Atlanta has yet to follow suit, even as traffic fatalities in Georgia have increased in recent years. An important step in pursuit of reducing traffic deaths is identifying where fatalities and severe injuries occur.

This analysis has identified the 84 streets that account for 88% of fatalities and 59% of severe injuries within the City of Atlanta from 2014-2016. In addition, this analysis showed that 10 streets, despite constituting only 3% of the city's street network, account for one third of all traffic-related fatalities. By creating a High-Injury Network, this analysis shows that traffic-related fatalities in Atlanta are not random and unpredictable--in fact, they are concentrated on relatively few streets.

This analysis provides city leaders and neighborhood advocates a template for where infrastructure improvements should be targeted to reduce the incidence of traffic fatalities and severe injuries. As research has shown, reducing vehicle speeds can often make the difference between life and death. The streets identified here should receive priority when it comes to implementing countermeasure investments aimed at reducing vehicle speeds. Along with street design countermeasures, enforcement should target driver behaviors that most often result in traffic fatalities and severe injuries. In order to do so, changes to state law which currently handicaps valuable traffic safety enforcement mechanisms must be reconsidered.

In addition to the goal of Vision Zero itself, Sweden offers another important lesson to U.S. cities and states. If Vision Zero considers only the fatalities and severe injuries that occur on local streets, we are ignoring the thousands of deaths that occur on freeways and interstates every year. To do so requires Vision Zero efforts to step beyond the largely urban bike and pedestrian advocacy groups where it has taken root, to take a regional perspective and build new partnerships around a common goal.

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